ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF NATURAL SCIENCE
DEPARTMENT OF STATISTICS

FACTORS INFLUENCING THE USE OF MODERN CONTRACEPTIVES AMONG MARRIED WOMEN IN ETHIOPIA

BY

KEBEDE ABU

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This is to certify that the thesis entitled "**Factors influencing the use of Modern Contraceptives among married women in Ethiopia**" submitted in partial fulfillment of the requirements for the degree of Master of Science in Statistics complies with requirements of the university and meets the accepted standards with respect to originality and quality.

Signed by the Examining committee:

Advisor: Prof M.K.Sharma Signature_____ Date _____

Examiner_____ Signature _____ Date_____

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_____

Chair of Department or Graduate Program Coordinator

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
CPR	Contraceptive Prevalence Rate
CSA	Central Statistics Agency
EAs	Enumeration Areas
EDHS	Ethiopia/Demographic Health Survey
ML	Maximum Likelihood
OLS	Ordinary Least Squares
UN	United Nation
FP	Family Planning
FGAE	Family Guidance Association of Ethiopia
HIV	Human Immunodeficiency Virus
IUD	Intra Uterine Device
LAM	Lactational amenorrhea method
MOH	Ministry Of Health
NGO	Non Governmental Organizations
SPSS	Statistical Package for Social Science
STDs	Sexually Transmitted Diseases
TFR	Total Fertility Rate
UNDP	United Nation Development Program
UNFPA	United Nation Population Fund
UNICEF	United Nation Children's Fund
WHO	World Health Organization

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ABSTRACT

The rapid population growth does not match with available resource in Ethiopia even though household level family planning delivery has been put in place. This study has the objective to identify factors that influence modern contraceptive use among married women in Ethiopia. The data in the study were obtained from the 2011 EDHS. Cross tabulations were carried out at the bivariate level to assess the association between modern contraceptive use and each of the independent variables while binary multiple logistic regression analysis was used to identify the factors influencing modem contraceptive use among married women in Ethiopia. Results of the multiple logistic regression analysis indicated that age of woman had statistically significant positive effects on modern contraceptive use. The likelihood of modern contraceptives use increased with increase in married women's age and then decreased towards the end of women's reproductive age. Furthermore, uneducated women and women without work, who did not want any more children and woman who were in the lowest wealth status were less likely to use modern contraception. As a result, policy makers responsible for national family planning programs need to target husbands by constructing a message that encourages male participation in family planning. This could be through involvement of males in family planning programs.

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

Rapid population growth, which in many instances far outstrips economic growth and environmental sustainability, is the reality in most developing countries of sub-Saharan Africa (UNDP, 1992). Issues related to childbearing and birth control in the African continent, especially the sub-Saharan region, are of policy interest because of unusual increases in population growth that this area has experienced in the past decade (USAID, 2009). Cohen (1998) suggests that sub-Sahara is among the major regions of the developing world that have not yet undergone a general decline in fertility. Ethiopia is the second most populous country in the sub-Saharan Africa next to Nigeria, with population growth rate of 2.6 percent per year and the total fertility rate approximate to 5 (CSA, 2007 ; MOFED, 2010). Factors contributing to high fertility include low socio-economic development, deeply-ingrained cultural values for large family size, and low levels of contraception (Bertrand, 2003).The type of development which involves complex interconnected processes of expanding education, health, employment and other basic needs provides the chief ingredient for lasting demographic transition with markedly reduced fertility and mortality (Speth, 1994).

As a consequence, the question of how fertility is expected to decline in the presence of family planning programs that promote contraceptive measures is of theoretical as well as policy importance. It is believed that family planning program through promoting the use of contraceptive use have played an important role in reducing high fertility and its negative effects on health and development. In the early stage of an implementation of the program, its focus is to motivate couples to adopt contraceptive use. Therefore, contraceptive prevalence has been used as an indicator to evaluate the implementation of family planning program (Amaha and Fikre, 2006).

Contraception is defined as a practice of methods of preventing or planning of conception. Contraceptive methods can be modern, traditional and folkloric methods of contraception. Among the methods, modern method included like Pill, IUD, Injectables,

condom, LAM etc; traditional method included periodic abstinence, withdrawal while folkloric method included use of herbs etc.

A study done by Donaldson and Tsui (1990) shows, nearly 30% of married couples in developing countries use traditional contraceptive methods such as withdrawal and "counting." For example, in most rural areas of Ghana and Nigeria where traditional values change slowly, there is a positive relationship between traditional methods of contraceptive use and women's educational levels (Bertrand et al, 1993). Birth control has become more common in less developed countries, and this growth has been in the form of modern methods of contraceptive use (Gille, 1985). Hanks (2003) argue that since most traditional contraceptive methods like withdrawal and "counting" are behavioral they are unpredictable. According to (Trussel and Kost, 1987) modern contraceptive methods are more effective in preventing pregnancies.

The EDHS 2011 report indicates that use of modern contraceptive methods among currently married women has increased from 2000, 2005 and 2011 by 6 % , 14%, 27 % respectively while the trends of traditional methods use remains the same for 2005 and 2011 about 1 %. The increase in modern method use is attributed primarily to the sharp increase in the use of injectables, from 3 % in 2000 to 21 % in 2011. This study will focus only on the usage of modern contraceptives in Ethiopia by women's of child bearing age.

1.2 Statement of the problem

It is believed that population growth and family planning are closely related concepts. Family planning is being prevalently used in different countries to make population growth parallel with economic growth. The population growth of many developing countries is found to be exponential (Shryock and Siegel, 1976). It is critical for family planning workers to continue to meet the needs of existing contraceptive users, and also to address barriers for contraceptive users in the society since, individual interests, behaviors, etc. differ from one unit to another within each level, owing to variability among various socioeconomic and geographical factors such as religion, culture, income, place of residence, education, occupation, mass media access, administrative and social

facilities, and so on. Ethiopia is one of developing countries, which is motivating women to use family planning currently. This issue led us to generate ideas by identifying factors influencing the use of modern contraceptives in Ethiopia among women of childbearing age.

1.3 Objectives of the Study

General objective

The general objective of the study is to determine the factors which influence the use of modern contraceptive use among married women aged 15-49 years in Ethiopia.

The specific objectives of the study are:

- To identify socio-economic, demographic and other proximate factors that affect the use of modern contraceptive methods among married women of child bearing age in Ethiopia.
- To provide relevant recommendations for policy makers and suggest directions for future studies.

1.4 Significance of the Study

In Ethiopia only a few studies explored the role of men and implication of women's socio-economic and decision-making autonomy on couple's family planning practices. This study will evaluate the involvement of husbands in identifying obstacles of family planning adoption and its continued use.

Family planning programmers and health sector could benefit from the findings of the study as a basis for further studies. In addition, it is expected that this study could provide information to government and other concerned bodies in setting policies, strategies and further investigation for reducing fertility.

1.5 limitations of the study

The explanatory variables employed in this study are age of women, religion, place of residence, region, wealth index, number of living children, women's educational level, desire for more children, knowledge about modern contraception, husband's education

level, working status of women, decision maker for using modern contraception and exposure to mass media and result might vary if some more explanatory variables are added. There are other characteristics such as availability of the method near to their home and the costs of modern contraceptives because of the variables are not included in the current survey (EDHS, 2011) which may have significant relationships with modern contraceptive use.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Population and Family Planning

Global population which stood at 2.5 billion in 1950 has risen to 7 billion today. It was suggested that the world will have 9.1 billion inhabitants by 2050, when growth will be approximately 34 million a year (UN, 2005). Henshaw (1999) also noted that increasing population size in the world especially in developing countries seemed to be linked to increasing unintended pregnancies taking place in the world today.

Family planning is defined as controlling births, bringing about wanted births, regulating the interval between births and determining the number of children in the family (Family Planning Handbook for Midwives and Nurses, IPPF Medical Publications. London, 1986). Family planning programs have been developed and supported to provide people with a means to achieve the number of children they desire and to reduce unwanted pregnancy, as a means of improving the health of women and children, and to contribute to slower population growth and more rapid economic development.

Family planning implies that "every child should be a wanted child". Furthermore, family planning services provide a medically sound way to reduce unwanted pregnancies that could otherwise lead to maternal deaths or injury from dangerous abortion procedures (Harvey, 2000).

2.1. 2 Overview of Ethiopia policies on Family Planning

Ethiopia, a country with the highest levels of fertility, has developed a population policy which aims to increase the prevalence of contraceptive use from the 1993 level of 4% to 44% by the year 2015 (National Population Policy of Ethiopia, 1993). Several policies and strategies are being developed while others have already been adopted calling for support to reproductive health and family planning services and availability of contraceptives. The Health Policy and Health Sector Development Plan, for instance, makes provisions for reproductive health, and family planning is mentioned in the basic

health package. The family planning program's messaging is heavily focused on the role of family planning on maternal and child health, with reference to development taking root rather slowly. Its aim is to increase contraceptive use through improving the family planning supply and service environment, based on the assumption that greater supply and better service quality will lead to more use.

Efforts have been made to promote family planning services in Ethiopia by the Family Guidance Association of Ethiopia (FGAE) since 1966.

Family planning helps everyone in different ways (WHO, 1970):

- It protects women from unwanted pregnancies and all negative consequences following the pregnancy.
- It improves the life of the family. The women would be in a position to care for a smaller number of individuals and this leads to the provision of a better life for the whole family. Parents could send their children to school longer.
- It advances the national development. A decline in fertility leads to an increase in the per capita gross national product.
- It preserves natural resources.

Hence, family planning versus population growth was the motto of the national population policy in Ethiopia. Family planning programme is perhaps the most effective policy intervention to control fertility and stabilize population size.

Contraception is the need of the day to counteract the explosive increase in population. According to some scholars, reproductive technologies and practices are considered very important in determining which type of contraception to use (Halpern, et al., 2008; Handwerker, 1983). While it is important to know what contraception means, this review focuses on the determinants of contraceptive use among women of childbearing age in sub-Saharan Africa with particular reference to Ethiopia.

The DHS conducted by Central Statistical Authority is the main source of information on the situation regarding family planning. Information collected through DHS covers various aspects of contraceptive knowledge, attitudes and behaviour, and focuses on both men and women. Specific information collected includes knowledge on contraceptive

methods, ever-use of contraception and current use of contraception. Low levels of contraceptive prevalence rate in Ethiopia is an indication that family planning programmes have yet to have a significant impact on population growth, hence requiring new strategies. Family planning means in Ethiopia can be through modern methods, traditional or folkaric methods. There is an ever increasing modern contraceptive method available to women. The ideal contraceptive would be effective, easy to use, safe and inexpensive. Safe and reliable family planning directly improves public health. Currently, government and the international community strengthen programmes that increase the modern methods.

2.2.1 Modern Contraceptive Methods

Modern methods of contraception refer to clinic and supply methods such as intra uterine device (IUD), pills, injectables, LAM and condoms. Modern contraceptive methods, such as, IUD, condom and injectables are the most widely used methods among women in developing countries. These methods accounted for over 85% of all contraceptive use in 2007 (United Nations Population Division, 2008).

Condom: Condom is the basic means for protecting HIV/AIDS and other sexually transmitted diseases (STDS).Condom is not only a protection against STDS but also unwanted pregnancy. This method is widely used in central Africa, Asia and South America (Nations Population Division., 2008).

Injectables: they are the most popular modern contraceptive method in Sub-Saharan Africa (Bertrand, 2003; Nations Population Division., 2008).

2.2.2 The Ethiopian Modern contraceptive situation

In Ethiopia, like any other country in the world, certain contraceptive methods are most preferred by married and unmarried women. For example, if we look into the 2002 statistics of the percentage contraceptive users by type of contraceptive method, those women who used pills constituted 58.5% followed by Depo-Provera (29.6%) and condoms (10.6%). In Ethiopia, most women prefer to use injectable contraceptives to other methods because of their convenience, as they are taken as a single shot and

provide protection for three months. Other contraceptive methods including IUD and Norplant accounted for the remaining 1.3%. However, the 2007 report of the Ministry of Health showed that those women who used Depo-Provera accounted for 38.5% followed by condoms (31.2%), Pills (29%) and the rest methods (1.3%) in 2006 (MOH,2007).

Except differences in the percentages of the contraceptive methods used, Depo-Provera, pills and condoms are the ones in common use in different parts of the country (Kebede, 2000; Loha et al.,2003; Korra ,1998 and Senbeto et al.,2005).

It is important to note that the study of contraception prevalence in the country is vital because contraception plays an important role in determining fertility levels and trends.

2.3. Contraceptive prevalence Rate

Nowadays, in the world fertility rates have been declining and contraceptive prevalence has been rising for decades. The world's contraceptive use progress was greatest in the least developed countries, where contraceptive adoption came close to doubling during the 1990s, rising to 32% in 2000 from the low level of 18% in 1990 (UNICEF, 2007).

In Ethiopia, the contraceptive prevalence rate rose from 6 percent in 2003 to 14 percent in 2005 to 30 percent in 2009 (UNFPA, 2010).

Population is determined by birth rate, death rate and migration flows. This in turn depends on numerous socioeconomic factors. Moreover, countries were advised to set goals as well as to meet them. Countries were also encouraged to provide family planning services. So it has become necessary to identify the factors influencing fertility and family planning adoption. Family planning can be adopted voluntarily through the practice of contraception or other methods of birth control on the basis of knowledge, attitude and responsible decision by individuals and couples, in order to promote the health welfare of the family and contribute to the social and economic development of the country.

Demographic, socio-economic and attitudinal factors account for the variations on the practice of contraception. Therefore it's become necessary to review the existing

literature on socio-economic, demographic factors and proximate factors as determinants of women's contraception.

2.4 Factors affecting contraceptive use

Differences in contraceptive use are primarily responsible for the differences in fertility among various groups of women. There are different factors that may influence contraceptive use. These factors may be grouped into broad categories: demographic factors, Socio-economic factors and other proximate factors towards contraceptive use (Daniel, 1995).

2.4.1 Demographic Factors

Various studies have identified different demographic variables as they influence the use of contraceptives. These variables among others include age of women, number of children living and desired number of children.

Age of woman: Studies conducted in different parts of Ethiopia showed that age was among the most important factors affecting contraceptive use and women between 15-19 years old were found at low level of using contraception, while women in the age group of 24-34 years are 1.68 times more likely to practice contraception than women in 15-19 years of age (Yigzaw, 2000; Tekabe et al., 1995; Yared et al, 1998 and Hana, 2002).

Number of living children: The number of living children refers to the number of children the woman had at the start of the segment of use. Contraceptive use tends to rise with the number of living children a woman has (Bertrand et al., 2003).

A study in Uganda, found that contraceptive use increased with parity. Women with one to three children were nearly three times more likely to use contraception than those with no children (Gupta et al., 2003; Uyger and Erkaya , 2001). Another study conducted in Addis Ababa showed that women who already had given enough birth as many or more than 5 living children showed a negative attitude towards contraception (Zelalem, 1996).

Parents who have been experiencing the death of a child may be less likely to use contraceptives than others of the same parity. Different studies have argued the existence

of a positive impact of infant and child mortality on fertility (Conley et al., 2007). Palloni and Rafalimana (1999), for instance, claimed that mortality reduction at least initially, the rational response to the realization that with lower infant and early child mortality fewer births are needed to secure a desired number of surviving children. That is to say the desire to replace a dead child or to ensure against childlessness contributes to high fertility. To this regard, societies with high infant mortality rates also have high fertility rates, in part because couples try to compensate for infant deaths (World Bank, 2007).

Desire for more children is the most frequent reason given in sub-Saharan Africa for not using contraceptives. A study done by Roy et al (2003) on Africa showed that, one third of women did not use contraception because they desired to have another child. About two- third of those with no children or only one child reported that they would use contraception after they had enough children. They would not practice any methods if they still desired for additional children in the near future.

Women and men in sub-Saharan Africa believe that bearing many children will provide protection against poverty during their old age (Bertrand, 2003).

2.4.2 Socio-economic Factors

Among socio-economic factors that may affect contraceptive use , education of women, place of residence, religion, work status/occupation, knowledge about contraceptive method are considered to be important (Daniel, 1995) .

Women's Education*:* Education is another social factor that influences modern contraceptive use. Education has long been associated with declining fertility and increasing contraceptive use since the publication of the results of the first World Fertility Survey in the mid-1970's. The study showed also that better educated women were more likely to practice contraception and to use modern methods. Women with higher levels of education tend to prefer fewer children (Shapiro and Tambashe, 1994).

Even after taking account of other factors, researchers consistently have found that better educated women are more likely to use contraception. While a husband's education also

has a positive effect, it is less important than the wife's education (Bertrand, 2003, World Bank, 1994; Oyedokun, 2007; Hogan and Biratu, *2004*).

The results of a study done by the World Bank on modern contraceptive use and fertility regulation among women of reproductive age group in Zimbabwe have significant association with increased educational attainment, although at low level of education (less than 6 years) there was no clear association between education and use of modern contraception. It was reported among women who have completed primary school (seven years of education) that the powerful effect of education becomes apparent, Similarly women who have completed secondary school and above were about twice as likely to use modern contraceptive methods as women who didn't complete primary schooling (World Bank,1994).

A study by Charles et al (2003) conducted in Uganda also has shown that modern contraceptive use was independently and positively associated with formal education. The study reported that in urban areas women with at least a secondary education had significantly higher odds of contraceptive use than non-educated women. The effect of education on use was even more striking in rural areas; compared with woman with no education, those with at least some primary schooling or higher had nearly five times the odds of contraceptive use and those with secondary or higher had almost ten times the odds of contraceptive use.

Other studies in different parts of the world have also shown a positive linear relationship between education and modern contraceptive use (Henry et al., 1996; Shahid and Chakroborty, 1993).

In Ethiopia the situation is not different from the above-mentioned facts. A study conducted on urban youth in Ethiopia indicated that contraceptive use was 4.9% in those with no education, 13.1% in low education and 82% among higher education (Tesfaye, 1996). In one study conducted in southern Ethiopia reported broad association of literacy with current and intended use of contraception (Dennis et al, 1999).

A study conducted in Gondar town by Yigezaw (2000), showed that there was a positive trend of association in contraceptive use with increased educational status. Beekle and

McCabe (2006) and Korra (2002) found strong associations between women's education and contraceptive use in Ethiopia.

There are a number of potentially confounding background socio-demographic variables that could affect or override the significance of education and the mediating factors that could explain the link with contraceptive use. For example, urban and rural locations (Hogan et al, 1999; Korra, 2002), age (Hogan et al., 1999), religion (Hogan et al., 1999) and number of children born (Korra, 2002) have been identified as factors in Ethiopia that may significantly influence desire to limit childbearing and increase contraceptive use.

Place of residence: The most consistent difference in levels of contraceptive use among groups is between rural and urban women. A study done in Tanzania showed that women who lived in urban areas were 1.6 times more likely to use contraceptive methods than women who lived in rural areas (Jato et al., 1999). In most developing countries, rates of contraceptive use among reproductive age women in rural areas are lower than in urban centers. Jamaica is an example of exception where rural and urban levels of contraceptive use are equal (Bertrand, 2003).

Economic status: Economic status showed a strong positive relationship with contraception practices. Using of contraception was rising steadily as their economic status increases (Shapiro and Tambashe, 1994). The finding of Hogan et al. (1999) showed economic status and women's paid employment in Southern Ethiopia to be associated with contraceptive use, with the latter significantly increasing the likelihood of contraceptive use (they did not, however, test its link with education).

Mass media exposure: Exposure to mass media is an effective way towards contraceptive behavior. In relation to Ethiopia a study showed that women who are exposed to the broadcast or the newspaper had better knowledge about family planning compared with women who had no media exposure at all. Moreover, women with media exposure were about four times as likely to use a method of family planning as compared to women with no media exposure. The study concluded that media exposure had a profound effect on contraceptive use (Antennae, 2002).

Religion: The religious background of a given community has a powerful effect on health seeking behavior in general, and contraceptive use in particular. Globally, the strongest opposition was from the Catholic Church, which prohibits utilization of artificial contraception in the 1930s and Islamic religion followed it (Charles et al., 2003). A study conducted in Bangladesh revealed that the percentage of current users of contraceptive methods among Muslims was significantly lower than their non-Muslim counterparts 30.2% and 36.3%, respectively (Shahid and Chakroborty, 1993). According to the 2000 demographic and health survey (DHS) Ethiopia report, significantly high proportion of females reported that in most cases religious leaders oppose the use of modern contraceptives and religion was the determinant factor to the use of contraception (CSA, 2000).

2.4.3 Other proximate factors towards contraceptive use

Contraceptive knowledge: Most studies have shown that there is a wide gap between knowledge and use of modern contraception. Surprisingly, knowledge about modern contraception is relatively high when compared with utilization rate. For instance, knowledge about modern contraceptive was around 85% in Tanzania and 81% in Ethiopia, but their contraceptive prevalence rate was far below 20% (Olenik ,1998 and CSA , 2000).

A study conducted in Africa identified that high proportion of women (74.3%) who belonged to various clubs and associations that discussed health related topics were knowledgeable and contraceptive users, which indicated that information exchanges through discussion in such organization increase the desire for modern contraceptive use (Henry et al., 1996).

A study conducted in Southern Ethiopia in 1997 showed that 8.5% of urban and 64.3% of rural residents had no knowledge of modern contraceptive while 5.3% of urban and 11% of rural respondents knew only one type of modern contraceptive method (Bettemariam et al., 1999).

Even though modern family planning in Ethiopia is a recent phenomenon, particularly in rural areas, knowledge of contraceptive methods is relatively high, with 82% of all women aged 15- 49 knowing at least one method of family planning (CSA, 2000) .

Among women in a rural community around Jimma, western Ethiopia, knowledge of contraception was 41% and knowledge of any modern method 31%, knowledge of contraceptive limited to pills 67.3%, injectables 5.7% and rhythm 27% (Mirgessa, 2000).

Knowledge of contraceptives was significantly associated with modern contraceptive use (Misganaw et al., 1995). It is believed that information, education and knowledge about the importance of modern contraceptive use play an important role in raising contraceptive prevalence rate. However, different empirical evidences revealed that having knowledge about modern contraception alone could not guarantee utilization of the service. Thus, it can be concluded that modern contraceptive use does not necessarily depend on the knowledge of methods but there are other additional determinant factors that influence the utilization of the service. Among the various determinant factors indicated by different studies conducted so far, few important factors indicated will be reviewed below.

Male involvement includes the number of men who encourage and support their partner and their peers to use family planning. In the past, family-planning programs have focused attention primarily on women, because of the need to free women from excessive child-bearing, and to reduce maternal and infant mortality through the use of modern methods of contraception. Most of the family-planning services were offered within maternal and child health centers, most research and information campaigns focused on women.

Recently family planning programs and providers believe that involving men in addition to women in family planning results in an improved program effectiveness. Men's support or opposition to their partners' practice of family planning has a strong impact on contraceptive use in many parts of the world, including Africa. Within marriage in Africa, men typically have more say than women in the decision to use contraception and in the number of children that the couple will have. Many women do not use

contraception because their husbands are opposed (Schuller et al, 1994). In seven Sub-Saharan Africa countries, contraceptive use among women whose husbands disapprove of family planning averages only one-third as much as among women whose husbands approve of it (Daniel, 1995). In Kenya, among women who had stopped using contraceptive for reasons other than having another child, 12% stopped because their husbands wanted another child, or forced them to discontinue for another reason (Ferguson, 1992).

Reviewing the socioeconomic and demographic data available from various studies undertaken in different corners of Ethiopia, determinant factors, such as, desire for more children, sex, discussion between a woman and her partner concerning family planning were found to be significantly associated with contraceptive use (Mesfin, *2002*). Moreover, place of residence, occupation, age of women, educational status of women and religion, marital status, accessibility to family planning services, number of living children, knowledge about the methods, etc. were identified to have had some kind of association with contraceptive use (Korra, *1997).*

The list of the above factors is not an exhaustive one. There could still be other demographic and socio-economic factors that may influence the use of the various types of family planning methods in different parts of the world.

CHAPTER THREE

3. Data and Methodology

3.1. Source of Data

This study used secondary data from the 2011 Ethiopian Demographic and Health Survey (EDHS) obtained from Central Statistical Agency (CSA). It was the third Demographic and Health Survey to be conducted in Ethiopia, and the objective of the survey was to provide current and reliable data on fertility and family planning behaviour, infant and child mortality, adult and maternal mortality, children's nutritional status, use of maternal and child health services, women's empowerment, knowledge of HIV/AIDS, and prevalence of HIV/AIDS and anemia. In relation to this women of reproductive age (15-49) are the main focus of this survey. The DHSs are typically conducted every five years and usually based on a large sample. The sample design for the 2011 EDHS provides estimates at the national (total, urban, and rural) and regional levels. This study used data on a total of 9,438 married women in the age group 15-49 years for analysis of the demographic and socioeconomic factors influencing women use of modern contraceptives in Ethiopia.

3.2. Variables of the Study

Variables considered in this study were selected based on earlier studies at the global and national level. As discussed in the literature review socio-economic, demographic and proximate factors are taken as determinants of married women's contraceptive use.

3.2.1 The Dependent (response) Variable

The use of modern contraception is analyzed for women aged 15-49 years who were asked whether they used modern contraceptives or not. Specifically this refers to condoms, oral pills, Intra Uterine Contraceptive Device (IUD) and injectables, etc. For the study purpose the response variable can be represented in a binary form where those women currently using modern contraceptive (i.e a woman is characterized as modern method user if she uses any of oral Pill, IUD, condoms or Injectables etc.) will be coded

as 1 and those who are not currently using modern contraceptive were coded as 0. Hence, the response variable y_i for i[th] woman can be expressed as:

$$y_i = \begin{cases} 0, not\ using\ contraceptive \\ 1, \quad using\ contraceptive \end{cases}$$

3.2.2 Explanatory Variables

Choice of explanatory variables for this study was based on literature reviews on the factors influencing modern contraceptive uses at the global level and in the country. Therefore, those variables, from literature are assumed to be as determinants of modern contraceptive uses are classified into demographic, socioeconomic and other proximate variables.

The explanatory/ independent variables included in this study are:

(a) Demographic variables: Includes, age of women, number of living children ,desire for more children, place of residence and region .

(b) Socioeconomic Variables: Economic status (wealth index), religious belief, employment status of a woman (working or not working), women's education, husband's education level, decision maker for using modern contraception and exposure to mass media.

(c) Proximate Variable: Contraceptive knowledge was included as a proxy indicator.

The descriptions of the socioeconomic, demographic and other proximate factors for the status of usage of modern contraceptive method are given below.

Table 3.1 Predictor variables included in the analysis

Variables	**Representations of variables**	**Value labels**	
Age of woman	X_1	1=15-19	5=35-39
		2=20-24	6=40-44
		3=25-29	7=45-49
		4=30-34	

Region	X_2	1=Tigray 7=SNNP 2=Afar 8=Gambela 3=Amhara 9=Hareri 4=Oromia 10=Dire Dawa 5=Somali 11=Addis Ababa 6= Benshangul – Gumuz
Place of residence	X_3	1= Rural 2= Urban
Religion	X_4	1= Coptic orthodox 3=Muslim 2=protestant 4= others
Woman educational level	X_5	1=no education 2=primary 3=secondary and higher
wealth index	X_6	1=poor 2=middle 3=rich
Knowledge of modern contraception	X_7	0= no 1= yes
Number of living children	X_8	0 =no children 1= 1 child 2= 2 or more children
desire for more children	X_9	1= wants no more children 2= wants more children
Work status of women	X_{10}	0= not working 1= working (paid)
Decision maker for using modern contraception	X_{11}	1= wife 2= husband 3= joint decision
Husband's educational level	X_{12}	1= no education 2=primary

		3=secondary and higher
Exposure to any mass media	X_{13}	0=No 1=Yes

3.3. Method of data analysis

3.3.1 The Logistic Regression

The statistical analysis of dichotomous outcome variables is frequently interpreted with the use of logistic regression methods, which is part of a category of statistical models called generalized linear models. Logistic regression allows one to predict a discrete outcome, such as group membership, from a set of variables that may be continuous, discrete, dichotomous, or a mix of any of these.

The Multiple Logistic Regression Model

The multiple logistic regression model is applied when the outcome variable is binary such as presence or absence of disease, defective or non defective product , did vote or did not vote etc. In logistic regression, the conditional mean is bounded between 0 and 1, rather than $-\infty$ and ∞, as in linear regression. The other prominent difference is that the conditional distribution of the outcome variable has a binomial distribution rather than a normal distribution. A description of the logistic regression model follows.

Suppose that we have n binary observations of the form y_i , i = 1,2, ..., n . Let Y denote a dichotomous outcome variable, which may assume values "1" if the event occurs (modern contraceptive use in our case) and "0" otherwise. Let the vector $X' = (x_1, x_2,..., x_k)$ denote a set of k predictor variables. The general data layout can be represented as follows:

$$X=\begin{pmatrix}1 & x_{11} & x_{12} & \ldots & x_{1k}\\ 1 & x_{21} & x_{22} & \ldots & x_{2k}\\ . & . & . & \ldots & .\\ . & . & . & \ldots & .\\ . & . & . & \ldots & .\\ 1 & x_{n1} & x_{n2} & \ldots & x_{nk}\end{pmatrix}_{nx(k+1)} \quad \text{and } Y=\begin{pmatrix}y_1\\ y_2\\ .\\ .\\ .\\ y_n\end{pmatrix}_{nx1}$$

Where, X is called the design or regression matrix. And without the loading column of 1's, this design matrix is said to be predictor data matrix.

Then the logistic model which relates the probability of the event occurring to the predictor variables x is given by:

$\pi(xi)$ is the probability that i[th] woman is being used modern contraception given that k predictor variables. β is a vector of unknown coefficients (i.e $\boldsymbol{\beta}=(\beta_0,\beta_1,\beta_2,\ldots,\beta_k)'$

$$P(Y=1/X=xi)=\frac{\exp(\beta_0+\beta_1x_{i1}+\beta_2x_{i2}+\ldots+\beta_kx_{ik})}{1+\exp(\beta_0+\beta_1x_{i1}+\beta_2x_{i2}+\ldots+\beta_kx_{ik})}=\frac{e^{\mathbf{x'\beta}}}{1+e^{\mathbf{x'\beta}}}=\pi(xi) \qquad [3.1]$$

and thus $P(Y=0/X=xi)=1-\pi(xi)$

After performing the logit transformation on $\pi(x_i)$ in equation [1] we obtain the following logistic model:

$$\log it(\pi(xi))=\log\left[\frac{\pi(xi)}{1-\pi(xi)}\right]=\beta_0+\beta_1X_{i1}+\beta_2X_{i2}+\ldots+\beta_kX_{ik}\ ,i=1,2\ldots,n \qquad [3.2]$$

where log denotes the natural logarithm. This class of generalized linear models allows $\pi(x_i)$ to be related to the linear component $\beta_0+\beta_1X_{i1}+\beta_2X_{i2}+\ldots+\beta_kX_{ik}$ by the use of a logistic link function.

Where: β_0 is the constant of the equation and, $\beta_1,\beta_2,\ldots,\beta_k$ are the coefficients of the predictor variables. The above equation is known as the logistic function.

3.3.1.1 Assumptions of logistic regression

In order for our analysis to be valid, our model has to satisfy the assumptions of logistic regression. When the assumptions of logistic regression analysis are not met, we may have problems, such as biased coefficient estimates or very large standard errors for the logistic regression coefficients, and these problems may lead to invalid statistical inferences. Therefore, before we can use our model to make any statistical inference, we need to check that our model fits sufficiently well and check for influential observations that have impact on the estimates of the coefficients. Logistic regression is popular because it enables the researcher to overcome many of the restrictive assumptions of OLS regression. According to (Hosmer and Lemeshow, 1989) there are other assumptions one should consider for the efficient use of logistic regression such as:

- Linearity in the logit – the regression equation should have a linear relationship with the logit form of the dependent variable. There is no assumption about the predictors being linearly related to each other.
- The dependent variable need not be normally distributed (but does assume its distribution is within the range of the exponential family of distributions, such as normal, Poisson, binomial, gamma).
- Normally distributed error terms are not assumed.
- Meaningful coding. Logistic coefficients will be difficult to interpret if not coded meaningfully. The convention for binomial logistic regression is to code the dependent class of greatest interest as 1 and the other class as 0. Since logistic regression assumes that P(Y=1) is the probability of the event occurring, it is necessary that the dependent variable is coded accordingly. That is for the factor

level 1 the dependent variable should represent the desired outcome.

- Logistic regression does not assume a linear relationship between the dependent and the independent variables. It can handle nonlinear effects even when exponential and polynomial terms are not explicitly added as additional independent variables because the logit link function on the left hand side of the logistic regression equation is non-linear. However, it also possible and permitted to add explicit interaction and power terms as variables on the right-hand side of the logistic equation, as in OLS regression.
- Logistic regression requires the dependent variable to be binary or dichotomous.
- The categories must be mutually exclusive and exhaustive; a case can only be in one group and every case must be a member of one of the groups.

Odds ratio

Odds ratio is defined as the ratio of the probability of the occurrence of an event to the probability of nonoccurrence of an event (Wang, 2011). In binary logistic regression analysis, odds ratio is the exponent of the estimated coefficient exp($\hat{\beta}$) .

3.3.2 Fitting the Logistic Regression Model

The most commonly used method of estimating the *k+1* unknown parameters $(\beta_0, \beta_1, \beta_2, \ldots, \beta_k)$ of a logistic regression model is the method of Maximum Likelihood (ML). Maximum likelihood methods seek to maximize the log likelihood (LL) which reflects how likely it is (the odds) that the observed values of the dependent variable may be predicted from the observed values of the independents variables.

Recall that with a binary response: y= 1 with probability p and y = 0 with probability 1 − p. Then, probability, **p(y=1)** is given as $P = \frac{e^{\mathbf{x}'\boldsymbol{\beta}}}{1+e^{\mathbf{x}'\boldsymbol{\beta}}}$

where

$$\mathbf{x} = (x_1, x_2, ..., x_k)' \quad \boldsymbol{\beta} = (\beta_0, \beta_1, ..., \beta_k)$$

Observed values of $\mathbf{Y}$ say, $y_i's \quad (i = 1,2,...,n)$ are the n independent random observations corresponding to the random variables (Y_1, Y_2,…,Y_n). Since the Y_i is a Bernoulli random variable with functional form $p(Y = y_i) = p^{y_i}(1-p)^{1-y_i}$ and hence, the likelihood function of $\mathbf{Y}$ is given by:

$$\ell(\boldsymbol{\beta}, \mathbf{Y}) = \prod_{i=1}^{n} p^{y_i}(1-p\ )^{1-y_i} \qquad [3.3]$$

The estimation of $\beta_0, \beta_1, \beta_2, \ldots, \beta_k$, require the maximization of the likelihood function or equivalently the maximization of the natural logarithm of the likelihood function denoted by:

$$Logl(\boldsymbol{\beta}) = \sum_{i=1}^{n} \{y_i \ln[p] + (1-y_i)\ln[(1-p)]\ \} \qquad [3.4]$$

One approach to the maximization of [3.4] involves the differentiation of $\log\{l(\beta_0, \beta_1, \beta_2, \ldots, \beta_k)\}$ with respect to $\beta_0, \beta_1, \beta_2, \ldots, and\ \beta_k$, and setting the *k+1* resulting equations to zero. The most effective and well known Newton-Raphson iterative method can solve the equations. Newton's method usually converges to the maximum of the log-likelihood in just a few iterations unless the data are badly conditioned (Greene, 1993). In fact, the model fitting process could be facilitated by the widely available Statistical software such as SPSS, SAS and STATA. In this study, SPSS is used for analyzing the data.

3.4 Model Building and Selection of Predictor Variables

In a situation where there are many predictors it is often helpful to use a model selection procedure to obtain a model that uses a subset of the original predictor variables. We begin our data analysis by using the Pearson chi-square test to identify factors associated with modern contraceptive use and independent variables. Include all variables that are significant in the bivariate analysis at 25% as candidate of binary logistic regression

analysis. The enter method variable selection procedure was employed to select the important determinants of modern contraceptive use among married women in SPSS software. The statistical significance of the individual regression coefficients is tested using the Wald chi-square statistic and hence the importance of each variable included in the multiple logistic regression models should be verified by different model assessment techniques.

3.5 Assessing the Goodness of fit of the Model

3.5.1 The Likelihood Ratio Test

The likelihood ratio chi-square (G^2) statistic is the test statistic commonly used for assessing the overall fit of the logistic regression model. The likelihood ratio test, also called log- likelihood test, is based on (-2LL) (-2 times log likelihood). The likelihood ratio statistic is obtained by subtracting the two times log likelihood (-2LL) for the final (full) model from the log likelihood for the intercept only model. This log likelihood-ratio test uses the ratio of the maximized value of the likelihood function for the intercept only model L_0 over the maximized value of the likelihood function for the full model L_1. The likelihood test statistic is given by

$$G^2 = -2\log\left(\frac{L_0}{L_1}\right) = -2[\log(L_0)-\log(L_1)] = -2[LL_0-(-LL_1)] \qquad [3.5]$$

where LL_0 the log likelihood value for the intercept only model and LL_1 is the log likelihood value of the full model. The likelihood ratio statistic has a chi-square distribution and is used to test the null hypothesis that all logistic regression coefficients except the constant are zero. The degrees of freedom are obtained by taking the difference of the number of parameters in both models. It compared with chi-square value at the difference between degree of freedom of both models. A p-value less than 5 percent that leads to the rejection of the null hypothesis that all the parameters are zero. When this likelihood test is significant, at least one of the predictors is significantly related to the response variable.

Similarly, the null hypothesis that the model fits the data against the alternative that the model does not fit was tested using Hosemer-Lemeshow Test. A non-significant

Hosemer-Lemeshow means that the observed and predicted counts are close to each other and the model describes the data well. Besides, if the omnibus test of model coefficients is significant, it implies that the model fits the data adequately.

3.5.3 The Wald Test

The Wald statistic is an alternative test which is commonly used to test the significance of individual logistic regression coefficient of each independent variable. The hypothesis to be tested is:

$H_0: \beta_j = 0$ Vs : $H_A: \beta_j \neq 0$, j = 1, ..., k at α level of significance.

The square of the wald test statistic, Z, under the null hypothesis

$$Z^2 = W = \left(\frac{\hat{\beta}_i}{se(\beta_i)}\right)^2 \text{ follows an approximate } \chi_{(1)}^2 \qquad [3.6]$$

If the Wald test is significant for a particular explanatory variable then we would conclude that the parameter associated with the variable is not zero so that the variable should be included in the model otherwise the explanatory variable can be omitted from the model (Agresti, 1996).

3.5.4 R^2 Type Statistics for Logistic Regression

A number of measures have been proposed in logistic regression as an analog to R-square in multiple linear regressions. In logistic regression, there is no true R^2 value as there is in OLS regression. The maximum value that the Cox & Snell R-square attains is less than 1. The Nagelkerke R-square is an adjusted version of the Cox & Snell R-square and covers the full range from 0 to 1, and therefore it is often preferred (Bewick and Jonathan, 2005). In SPSS, there are two modified versions of this basic idea, one developed by Cox & Snell and the other developed by Nagelkerke (Long, 1997) and (O'Connell, 2006). The Cox and Snell R-square is computed as follows:

$$\text{Cox \& Snell Pseudo-}R^2 = 1 - \left[\frac{-2LL_{null}}{-2LL_k}\right]^{\frac{2}{n}} \qquad [3.7]$$

Because this R-squared value cannot reach 1.0, Nagelkerke modified it. The correction

increases the Cox and Snell version to make 1.0 a possible value for R-squared.

$$\text{Nagelkerke Pseudo-R}^2 = \frac{1-\left[\frac{-2\text{LL}_{\text{null}}}{-2\text{LL}_k}\right]^{2/n}}{1-\left[-2LL_{null}\right]^{2/n}} \qquad [3.8]$$

3.6 Model Adequacy

Once a model is fitted to the observed data, a thorough examination of the extent to which the fitted model provides an appropriate description of the observed data is a vital aspect of modeling process. The fitted logistic regression model may be inadequate due to a particular observation, termed outliers, or observations, termed influential values that have an undue impact on the conclusions to be drawn from the analysis and presence of complete or near compete linear dependencies among the predictor variables. Some of the statistical techniques which are employed to examine the adequacy of a fitted model include: detection and treatment of outliers and influence diagnostics.

3.6.1 Detection and Treatment of Outlier(s)

Observations that deviate from the remaining observations in the sample are called outliers**.** For binary data, an outlier occurs when the response variable equals unity and the corresponding fitted probability is near zero or vice versa (Collet, 1991). Since fitted probabilities near zero or one will occur when the linear predictor has a large negative or a large positive value, outliers can only occur at observations that have extreme values of the explanatory variables.

Some of the statistical methods that were used for detecting the presence and extent of influence of outlier(s) are: unstandardized residuals, $y_i - \hat{p}_i$; the Pearson standardized residuals, $\chi^2 = \sum_{i=1}^{n} \frac{(y_i - \hat{p}_i)^2}{\hat{p}_i(1-\hat{p}_i)}$ (the change in model deviance if the case is removed). Of these methods, the study employed the standardized residuals for identifying potential outliers.

Whenever outliers are identified, their effect on the results of the analysis can be assessed by re-analyzing the data after omitting them. If essentially the same inferences are drawn from the data both with and without the outliers, one need not be concerned about their presence. On the other hand, if the outliers do affect model-based inferences, the decision on how to treat them (to include them, to revise the model or to omit them) should not only be made on statistical grounds but also through closer subjective and objective examination of the data and its other essential ingredients. Hence, the presence of outliers was signaled if the Pearson standardized residuals lie outside the range of the interval -3 and +3 (Agresti, 2007).

3.6.2 Influence Diagnostics

An observation is said to be influential if its omission from the data set results in substantial changes to certain aspects of the fit of the linear logistic regression model. In most cases, it is more important to pay attention on outliers that are influential than those that are not. Although outliers may also be influential observations, an influential observation need not necessarily be an outlier. In particular, an influential observation that is not an outlier will occur when the observation distorts the form of the fitted model to such an extent that the observation itself has a small residual.

Some of the statistical methods used in influence diagnostics are: Leverage statistic; ($\hat{h}_{ii}$, which is its estimated diagonal elements of the hat matrix $H = X(X'\hat{V}^{-1}X)^{-1}X'$ with diagonal elements of $\hat{p}_i(1-\hat{p}_i)$, where $\hat{V}$ = estimator of the theoretical covariance matrix V); DFBETA (the change in the logistic regression parameter estimates when the observation is deleted); Cook's distance ($C_i = \frac{r_i \hat{h}_{ii}}{p(1-\hat{h}_{ii})}$ where r_i is the Pearson residual, $\hat{h}_{ii}$ the leverage of case i and p the number of parameters in the model). The study used Cook's distance to assess the overall impact of an observation on the estimated parameter vector $\hat{\boldsymbol{\beta}}$. Hence, points for which Cook's distance greater than one was considered as influential.

Cook's distance reveals the impact of the i^{th} observation on the entire vector of the estimated regression coefficients. The influential observations for the individual regression coefficients are identified by $DFBETA_j(i)$, j = 0, 1, 2, . . . , p, where each . DFBETA greater than unity will be considered as outlier(s) for critical variables in the model.

CHAPTER FOUR

4. STATISTICAL DATA ANALYSIS

This chapter presents the descriptive statistics and results of the proposed statistical models of modern contraceptive use for married women of childbearing age, from15–49 years. In this study, the data analysis progresses through various stages.

First, descriptive statistics was used to explore the background characteristics, such as demographic, socio-economic, proximate variables and level of modern contraceptive use. Next, bivariate analysis is done to examine association between independent variables and dependent variable by using cross tabulation and the Pearson chi-square test. In the third section, binary logistic regression was used to examine determinants of modern contraceptive use with respect to their demographic, socio-economic and proximate factors.

4.1 Descriptive analysis

This section presents a statistical description of major demographic and socioeconomic background characteristics of the respondents with modern contraceptive use (see Appendix A). Since all the variables (except age of women) are categorical, the variables are described in terms of the proportions in various categories.

Of the 9,438 married women who were in reproductive age group, only 2191 (23.2%) were using modern contraception. Proportion of married women of reproductive age using modern contraceptive is quite higher in rural areas with 44.4 % compared to their urban counterparts with only 17.2% in Ethiopia (Appendix A: Table 1).

As seen in (Appendix A: Table 2), modern contraceptive use increased with the increase in women's age; however usage decreased towards the end of women's reproductive age. The highest proportion (26.5 %) of women aged 35-39 were using modern contraceptives. The lowest proportion (8.8 %) of women aged 45-49 were using modern contraceptives.

With regard to religion the result indicates that modern contraceptive usage of women was highest among women that are followers of Coptic orthodox (33.8 %) followed by Protestants (23.2 %) and Muslims (15.2 %). The lowest contraceptive usage (11.5 %) of women was recorded for believers of other religions.

Regarding wealth status, modern contraceptive use increased, as the level of wealth status increased, ranging from 11.5 percent among the poorest to 37.3 percent among the richest.

Women who live in different regions also had different status on the usage of modern contraceptives. The highest proportion of contraceptive usage was observed in Addis Ababa (56.1%) followed by Amhara (31.5 %) and the least one was observed in Afar region (10.3 %) followed by Somali region (3.2 %).

Based on the women's education level, proportion of modern contraception use were 22%, 25.3 % and 26.5 % for married women with no education, primary education, secondary and higher education, respectively.

Among women without knowledge about family planning method, 3.2 percent used and 24.6 percent of married women who had knowledge about family planning method used modern contraceptives. The data also show that there is a gap between knowledge on contraception and contraceptives use.

About 19.7 percent of women who were not currently working had reported that they were not using modern contraceptives, where as 30.8 percent of women who had work are using modern contraceptives.

Current use of modern contraceptive increased with the higher level of husband's education.

With regard to decision making on modern contraceptive use, about 28 percent responded that both the husband and wife make the decision together. The result shows that there was no difference while making independent decisions between wife and husband about modern contraceptive use.

Among married women who were exposed to any kind of mass media, 37.1 percent used modern contraceptives and 62.9 percent did not use modern contraceptives. Of those married women who were not exposed to any mass media, only 16.3 percent used modern contraceptive.

4.2 The Bivariate Analysis

This section uses the Pearson chi-square test to identify factors associated with modern contraceptive use and independent variables. The level of significance for the association was set up at 20% to 25%. For all independent variables taking one-at-a time, a test of association was carried out using the Pearson chi-square. High values of Pearson chi-square for a given independent variable indicates that there is strong association between the given independent variable and the dependent variable keeping the effect of the other factors constant. That is, testing the hypothesis:

H_o= There is no association between the response and an independent variable

H_1= There is association between the response and a particular independent variable

The decision was based on the Chi-square value, P-value and at 0.05 level of significance.

Table 4.1 shows chi square values along with their associated p-values for the independent variables and modern contraceptive use.

Table 4.1 Association of Modern Contraceptive Use with Independent Variables Using Chi -Square Analysis

Independent Variables	Df	Pearson Chi-Square value	p- value
Age	6	136.368	0.000*
Religion	3	380.566	0.000*
Region	10	624.237	0.000*
Place of residence	1	670.406	0.000*

Educational level of women	2	16.045	0.000*
Knowledge of Modern contraceptive	1	151.085	0.000*
Educational level of husband	2	16.986	0.000*
Wealth index	2	750.624	0.000*
Number of living children	2	61.662	0.000*
Desire for more children	1	68.719	0.000*
Working status of women	1	143.512	0.000*
Decision maker for using modern contraception	2	16.380	0.000*
Exposure to mass media	1	504.287	0.000*

(* Significant at 5% level)

Table 4.1 shows that there is a statistically significant association ($\chi^2(2) = 750.624$, $p< 0.0001$) between modern contraceptive use and wealth index. Similarly, bivariate analyses using chi- square test at 5 % level of significance indicate current use of modern contraceptives was significantly associated with age of women, religion, place of residence, region, educational level of women, number of living children, desire for more children, knowledge about modern contraception, working status of women, educational level of husband, decision maker for using modern contraception and exposure to mass media.

4.3 Multivariable Analysis

Binary logistic regression was employed to predict the probability that married women use modern contraceptive. In order to identify the critical predictors of modern contraceptive use, all the variables that were found to be independently associated with married woman modern contraceptive use in bivariate analysis have been taken for multiple logistic regression model. Accordingly, since all predictors had p-value ≤ 0.05 and hence selected as predictors for multiple logistic regression analysis. The results of the binary logistic regression are given in Table 4.2 which displays the estimated coefficients, odds ratio, p-value and Wald statistic. The result revealed that out of

thirteen variables entered into the logistic model, only one that is, husband's level of education was found to be insignificant.

Binary logistic regression analysis revealed controlling other variables in the model, the odds of using modern contraceptive for married women aged 15-19 was 8.123 times higher than the odds of women aged 45-49 years. Similarly, the odds of using modern contraceptives among married women in the age 20-24, 25-29, are 6.952 times (OR: 6.952, CI: (5.064, 9.544)) and 5.363 times (OR: 5.363, CI: (3.980, 7.226)), respectively, higher than that for married women in the age group 45-49. The odds of using modern contraceptives among married women who were 30-34 years old was 5.017 times and among 35-39 years old was 4.901 times higher than that for women aged 45-49. In addition, women in the age group 40-44 were 2.773 times higher than the odds for women aged 45 - 49.

Married women in Amhara were 2.237 times (OR: 2.237, CI: (1.681, 2.976)) more likely to use modern contraceptives than higher than married women in Addis Ababa. Married women who lived in Benshangul- Gumuz were 78.2 percent more likely to use contraceptives compared to women in Addis Ababa. Conversely, Married women who lived in Somali were 79 % less likely to use modern contraceptive methods as compared to married women in Addis Ababa. While the odds of using modern contraceptives among married women living in Tigray, Afar and Harari is not significantly different from the odds of using modern contraceptives among women in Addis Ababa controlling for other variables in the model.

Married women who were followers of Coptic orthodox religion were 2.272 times (OR: 2.272, CI: (1.467, 3.518)) more likely to use contraceptives than those who were followers of religions other than Coptic orthodox, Protestant and Muslim. Protestant married women were 67.9 percent more likely to use modern contraceptives compared to those who were followers of religions other than Coptic orthodox, Protestant and Islam. The likelihood of using contraceptive methods among married women who were followers of Muslim was not significantly different from those who were followers of religions other than Coptic orthodox and protestant.

Married women who resided in the rural areas were 94.4 % more likely to use modern contraceptive compared to those married women living in urban areas.

Married women who did not have knowledge of modern contraceptive methods were 73.4% less likely to use modern contraceptive methods as compared to those who have knowledge of modern contraceptive use controlling other variables in the model.

Married women who were poor and middle wealth status were less likely to use modern contraception (61 % and 38 % respectively) than rich married women.

Married women who had not discussed family planning with their husbands were 25.6% less likely to use the modern contraception than those who made decisions jointly. However, married women who were leaving family planning decisions to their husbands alone were 30.9% less likely to use modern contraception compared to those who made decisions jointly.

As compared to married women who had 2 and more children , women with no living child were 64% less likely (OR: 0.360, CI: (0.286, 0.454)) to use modern contraceptive than those married women with 2 and more children. Similarly, women with one child were 15.2% less likely to practice modern contraception than those with two or more children controlling for other variables in the model.

Women who wanted no more children were 35.8 % more likely to use modern contraceptive than women who desired to have another child which was the reference category.

Regarding women's education, it shows that women with no education were 20.3 % more likely to use modern contraception and women with primary education level were 27.9 % more likely to use modern contraception than those with secondary and higher level education.

Married women who were not working were 20.5 % less likely to use contraceptives than married women who were engaged at work.

Married women who were not exposed to media are 35.8 % less likely to use modern contraception compared to those exposed to media.

Table 4.2: Results of Binary Logistic Regression Analysis for modern contraceptive use among married women in child bearing age by demographic, socioeconomic and proximate factors

Variables	β	S.E.	Wald	Df	Sig.	Exp(β)	95% C.I.for Exp(β)	
							Lower	Upper
Age (Ref: 45-49)			180.549	6	.000*			
15-19	2.095	.191	119.921	1	.000*	8.123	5.583	11.818
20-24	1.939	.162	143.857	1	.000*	6.952	5.064	9.544
25-29	1.679	.152	121.818	1	.000*	5.363	3.980	7.226
30-34	1.613	.154	109.940	1	.000*	5.017	3.711	6.783
35-39	1.589	.153	107.588	1	.000*	4.901	3.629	6.617
40-44	1.020	.165	38.050	1	.000*	2.773	2.005	3.834
Region (Ref: Addis Ababa)			164.023	10	.000*			
Tigray	-.048	.157	.093	1	.760	.953	.701	1.297
Afar	-.129	.161	.638	1	.425	.879	.641	1.206
Amhara	.805	.146	30.481	1	.000*	2.237	1.681	2.976
Oromiya	.319	.139	5.266	1	.022*	1.375	1.048	1.805
Somali	-1.565	.260	36.317	1	.000*	.209	.126	.348
Benshangul-Gumuz	.577	.149	14.938	1	.000*	1.782	1.329	2.388
SNNP	.327	.156	4.375	1	.036*	1.387	1.021	1.883
Gambela	.522	.167	9.826	1	.002*	1.685	1.216	2.336
Harari	.145	.154	.894	1	.344	1.157	.856	1.563
Dire Dawa	.546	.150	13.176	1	.000*	1.726	1.285	2.317

Place of residence (Ref: urban)								
Rural	.665	.084	62.968	1	.000*	1.944	1.650	2.291
Religion (Ref: others)			74.520	3	.000*			
Orthodox	.820	.223	13.519	1	.000*	2.272	1.467	3.518
Protestant	.518	.220	5.541	1	.019*	1.679	1.091	2.586
Muslim	.199	.223	.792	1	.373	1.220	.787	1.890
Wealth status (Ref: rich)			155.505	2	.000*			
Poor	-.945	.076	155.359	1	.000*	.389	.335	.451
Middle	-.476	.087	29.695	1	.000*	.621	.523	.737
Knowledge of modern contraception (Ref: yes)								
No	-1.324	.238	31.007	1	.000*	.266	.167	.424
Number of living Children (Ref: 2 or more children)			76.914	2	.000*			
No child	-1.021	.118	75.175	1	.000*	.360	.286	.454
1 child	-.165	.083	3.917	1	.048	.848	.720	0.998
Desire for more children (Ref: wants more)								
Wants no more children	-.444	.063	50.166	1	.000*	.642	.567	.725
Women's work status (Ref: working)								
Not working	-.230	.058	15.790	1	.000*	.795	.710	.890
Education level of women (Ref: secondary and higher)			16.014	2	.000			
No education	.185	.056	10.952	1	.001	1.203	1.078	1.342
Primary	.246	.086	8.110	1	.004	1.279	1.080	1.515

Decision maker for use (Ref: joint decision)			16.288	2	.000			
Wife	-.296	.074	16.079	1	.000	.744	.643	.859
Husband	-.169	.052	10.562	1	.002	.691	.423	0 .928
Education level of husband (Ref: secondary and higher)			.937	2	.626			
No education	.067	.083	.646	1	.422	1.069	.908	1.259
Primary	.082	.085	.917	1	.338	1.085	.918	1.282
Exposure to any media (Ref: yes)								
No	-.444	.063	49.281	1	.000*	.642	.567	.726
Constant	-2.300	.317	52.690	1	.000*	.100		

4.4. Goodness of fit of the logistic regression Model

A. Likelihood Ratio Test of Overall Binary Logistic Regression Model

Table 4.3 Likelihood Ratio Test of Overall Model

Model	-2*Log likelihood	df	χ2	Over all df	p-value
Empty	10228.096	1	1842.273	33	.000*
Full	8385.823	34			

Since, $\chi 2$ =1842.273 is greater than $\chi 2$ tab = 47.4 at df =33 with P-value = 0.000, which is less than 0.05 level of significance; the full model with predictors provided a good fit.

B. Omnibus Tests of Model Coefficients

The omnibus test of model coefficients tests if the model with the predictors is significantly different from the model with only the intercept. Since, Chi-square =

1842.2 is greater than $\chi 2$ tab = 48.604 at df=34 with P-value = 0.000*. It indicated that at least one of the parameters is significantly different from zero.

Table 4.4 Omnibus Tests of Model Coefficients

	Chi-square	Df	p-value
Step	1842.267	34	.000*
Block	1842.267	34	.000*
Model	1842.267	34	.000*

(* Significant at 5% level)

C. Model Summary of Binary Logistic Regression Model

The "pseudo" R^2 estimates in the Table 4.5 indicate that, approximately 17.6 % or 26.7 % of the variance in married women in Ethiopia whether using or not using modern contraceptives can be predicted from the linear combination of all variables supposed to be predictors of modern contraceptives use. Including those variables having significant association with modern contraceptive use of married women in reproductive age group by using binary logistic regression analysis for EDHS 2011 data, is appropriate.

Table 4.5 Model Summary of Binary Logistic Regression

Step	-2Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	8385.823[a]	.176	.267

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

D. Hosmer - Lemeshow Test of Goodness fit of Binary Logistic Regression Analysis

Goodness-of-fit statistics helps to determine whether the model adequately described the data. The Hosmer-Lemeshow statistic indicates a poor fit if the significant value is less than 0.05.

Table 4.6 Hosmer-Lemeshow Test

Chi-square value	Df	Pr > ChiSq
10.188	8	0.252

As we can see from Table 4.6 since Chi-square = 10.188 which, is less than 15.507 at 8 degree of freedom with P-value = 0.252 which is greater than 0.05 level of significance, the Hosmer - Lemeshow test is found to be insignificant suggesting, no evidence to reject the null hypothesis (the model adequately fitted the data).

E. Validation of Predicted Probability of Binary Logistic Regression Model

In addition to the measures of association, classification table shows the validity of predicted probabilities. Two terminologies involved in Classification table were:

Observed - this indicates the number of 0's and 1's that are observed in the dependent variable (currently use modern contraceptive).
Predicted - these are the predicted values of the dependent variable based on the full logistic regression model.

The classification Table 4.7 shows that with the cutoff set at 0.5, 29.3 percent of women who were using contraceptive were correctly classified whereas 94.2 percent of women who were not using contraceptive methods were correctly classified. About 79.1 % correct predictions of overall married women in reproductive age group is modeled by using binary logistic regression model.

Table 4.7 Classification table

Observed		Predicted		Percentage Correct
		Modern contraceptive		
		Not use	use	
Modern contraceptive	Not use	6826	421	94.2
	Use	1551	640	29.3
Overall percentage				79.1

Model diagnostics: Outliers and Influential observations

The adequacy of the fitted model was checked for possible presence and treatment of outliers and influential values. The diagnostic test results for detection of outliers and influential values are presented in Appendix B: Table B2. Cook's distance is a measure of the influences of cases. It is a measure of how much the residual of all cases would change if a particular case is excluded from the computation of the regression coefficients. The residuals less than 3 in absolute value show the absence of an outlier observation. The DFBETAs for model parameters (including the constant term), Cook's influence statistic and Leverage Values were less than 0.10752, 1 and 1 respectively. DFBETAs less than unity imply no specific impact of an observation on the coefficient of a particular predictor variable, while Cook's distance less than unity showed that an observation had no overall impact on the estimated vector of regression coefficients β. A value of the leverage statistic less than one shows that no observation is far apart from the others in terms of the levels of the independent variables (not the dependent variable).

Thus, from the above goodness of fit tests and diagnostic checking, we can say that our model is adequate.

CHAPTER FIVE

5. DISCUSSIOIN, CONCLUSION AND RECCONMENDATION

5.1 Discussion

The descriptive analysis of the study revealed that only 23.2 percent of the sample married women were using modern contraceptives. This study examined whether certain demographic, socioeconomic and proximate factors influence modern contraceptive use of currently married women aged 15-49 in Ethiopia. The results from binary logistic regression analysis revealed that age of women, region, place of residence, religion, wealth index, women's educational level, number of living children, desire for more children, women's work status , decision maker for modern contraception use and exposure to mass media have significant effects on married women's modern contraceptive use at 5% significance level. However, the impact of husband's education level was found to be insignificant.

This study found that using modern contraceptive is significantly associated with age of women. Married women aged 15-19,20-24, 25-29, 30-35 and 40-44 were more likely to use modern contraception (8.123, 6.952, 5.363, 5.017, 4.901, and 2.773 times respectively) than those aged 45-49 years which is the reference category. This indicates that odds of using modern contraception decrease as age of married women increase. This result maintains what is stated with studies done in Bangladesh as in (Khan, 1997).

Modern contraceptive use of married women had significant association with federal regions. The odds of using modern contraceptive of married women in Amhara was 2.237 times (OR: 2.237, CI: (1.681, 2.976)) was higher than that among married women in Addis Ababa. It is also observed that married woman in Somalia were 79% less likely to use modern contraception than married women in Addis Ababa while the odds of using contraceptive methods by married women living in Tigray , Afar and Harari were not significantly different from the odds for women in Addis Ababa.

The number of living children was another factor that was significantly associated with current use of modern contraceptives in the study. Married women with no living children were 64% less likely to use modern contraception (OR: 0.360, CI: (0.286, 0.454)) than married women with 2 and more living children. The odds of married women with one child were 16.2% less likely to practice modern contraception than those with two or more children. This finding suggests the importance of motivation for limiting family size. Women will practice contraception when they meet their desired family size. This finding is similar to a study in Uganda. It shows that contraceptive use increased with parity (Gupta, et al., 2003). Therefore, modern contraception utilization was higher among married women who had living children from 1 child and above.

In addition, the desire for more children had a statistically significant effect on modern contraceptive use. Married women who wanted no more children were 36% more likely to use modern contraception than those women who desired to have another child. This finding is not similar to a study in India, where it was found that women would not practice any method if they still desired additional children (Roy et al, 2003).

Women's education had also a significant effect on modern contraceptive use among married women. Married women who had no primary education were 23.4 percent less likely to use modern contraception than those women who had secondary education and higher. Generally, use of modern contraceptive is likely to increase when married women educational level increases. This is because they understand the benefits and the side effects of contraceptives better when they are more educated. That means women with more formal education were more likely to practice family planning than those with less education.

Married women's wealth status showed a statistically significant effect on the utilization of modern contraception. The higher the level of women's wealth status, the more they used modern contraception. Married women who were in the poor and middle wealth status were less likely to use modern contraception (61 % and 38 % respectively) than those in the rich wealth category which is the reference group. This finding is similar to that of a study in Kinshasa, Zaire, which shows that the use of contraception rises steadily as economic status increases (Shapiro and Tambashe, 1994).

In addition, women's working status had an important role in determining whether or not they use modern contraception. Women engaged in work were more likely to practice modern contraception than those who were not working.

The likelihood of using modern contraception is significantly associated with respondents religious affiliations ($p<0.001$). Followers of Coptic orthodox were 2.272 times (OR: 2.272, CI: (1.467, 3.518)) more likely to use modern contraceptives than those who were believers of other religion**.** Protestants were 68 percent more likely to use modern contraception than those in other religion. The likelihood of using contraceptive methods among married women who were followers of Islam was not significantly different from those who were followers of religions other than Coptic orthodox and Protestantism.

The effect of place of residence was found to be significant. Women who resided in the rural areas are 94.4 % more likely to use modern contraceptives compared to those married women living in urban areas. In the real situation in Ethiopia, it is easier for married women in urban area to get access to family planning information and services than those in rural areas.

It is surprising to find that husband's educational level had no significant effect on modern contraception. Formal education of the husband is also viewed as fundamental to individual understanding and to adopt method of contraceptive use.

Married women reported that decision to use contraceptives was made by husbands alone was 30.9% less likely to be current user of modern contraceptives compared to those reported joint decisions with their husbands. This result is consistent with previous studies done in different parts of Ethiopia that showed significant associations of men's involvement with family planning methods use (Terefe and Larson, 1993) .

Regarding media exposure, it was found that married women who received information from any mass media were significantly more likely to use modern contraception. This is similar to previous studies showing that exposure to mass media can be an important means to improve knowledge and initiate women to practice any form of modern contraception (Gupta et al.,2003).

5.2 Conclusion

Although knowledge on modern contraceptive is significantly high with around 94 percent among married women of reproductive age but utilization rate is very low with 23% of married women of reproductive age. The likelihood of being current user of modern contraceptives by a woman increased with increase in education level, having large number of living children, and woman participation in decision- making regarding using modern contraception. The main conclusion that was derived from the results of this study, was that, married women's were making rational choices in terms of their modern contraceptive use. This was demonstrated by the fact that there was at least one variable in every category of these factors that was found to have a statistically significant effect on the current use of modern contraception among the currently married women of reproductive ages considered in this study.

5.3 Recommendations

Based on findings of this study, to enhance modern contraceptive use by married women of reproductive age in a study population it is recommended that education about the importance of having smaller families should be intensified in communities. Furthermore, campaigns to empower women such as emphasis on their education, encouraging gender balance by changing community attitude towards position/status of women in a household and in a society as a whole should be strengthened. This would improve their participation in household decisions including those related to fertility and contraceptive use. Since a woman's perception of her husband's opinion about contraceptive use had a significant influence on her contraception practice, it seems that a husband's attitudes act as a serious obstacle to a woman's contraceptive use (Rahayu *et al*, 2009). Therefore, policy makers responsible for national family planning programs need to target husbands by constructing a message that encourages male participation in family planning. This could be through involvement of males in family planning programs.

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APPENDIX

APPENDIX A

Table A1: The Proportion of Current use of modern contraceptive

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	7247	76.8	76.8	76.8
	Yes	2191	23.2	23.2	100.0
	Total	9438	100.0	100.0	

Table A2: Descriptive Characteristics of Married Women in the reproductive age group by back ground characteristics

Variables	Modern contraceptive				Total
	Not use		Use		
	Count	(%)	Count	(%)	Count
Age					
15-19	585	81.2	135	18.8	720
20-24	1199	74.7	406	25.3	1605
25-29	1703	74.3	590	25.7	2293
30-34	1177	73.9	415	26.1	1592
35-39	1119	73.5	404	26.5	1523
40-44	797	81.8	177	18.2	984
45-49	667	91.2	64	8.8	731
Religion					
Orthodox	2252	66.2	1148	33.8	3400
Protestant	1239	76.6	379	23.4	1618
Muslim	3540	84.8	636	15.2	4176
Other	216	88.5	28	11.5	244
Place of residence					
Urban	6088	82.8	1267	17.2	7355
Rural	1159	55.6	924	44.4	2083
Women's educational level					

No education	4865	78	1371	22	6236
Primary	1805	74.7	612	25.3	2417
Secondary and higher	577	73.5	208	26.5	785
Knowledge of modern contraceptive					
No	607	96.8	20	3.2	627
Yes	6640	75.4	2171	24.6	8811
Wealth index					
Poor	3702	88.5	481	11.5	4183
Middle	1184	79.6	303	20.4	1487
Rich	2361	62.7	1407	37.3	3768
Region					
Tigray	754	79.9	190	20.1	944
Afar	925	89.7	106	10.3	1031
Amhara	867	68.5	399	31.5	1266
Oromiya	1092	76.7	332	23.3	1424
Somali	602	96.8	20	3.2	622
Benshangul-Gumuz	646	76.4	200	23.6	846
SNNP	848	79.3	222	20.7	1070
Gambela	505	77.1	150	22.9	655
Harari	382	71.5	152	28.5	534
Addis Ababa	232	43.9	297	56.1	529
Dire Dawa	394	76.2	123	23.8	517
Number of living children					
No child	150	6.9	803	11	953
1 child	445	20.6	1066	14.7	1511
2 or more	1569	72.5	5405	74.3	6974
Desire for more children					
Wants no more	4701	79.6	1207	20.4	5908
Wants more	2546	72.1	984	27.9	3530
Working status					
Not working	5170	80.3	1265	19.7	6435
Working	2077	69.2	926	30.8	3003
Education level of husband					

No education	3827	78.5	1049	21.5	4876
Primary	2448	75.3	804	24.7	3252
Secondary and higher	972	74.2	338	25.8	1310
Decision maker for using modern contraceptive					
Wife	6423	77.4	1877	22.6	8300
Husband	81	78.6	22	21.4	103
Joint decision	743	71.8	292	28.2	1035
Exposure to any mass media					
No	5278	83.7	1031	16.3	6309
Yes	1969	62.9	1160	37.1	3129

APPENDIX B: Logistic Regression Output using Enter method

Table B1: Contingency Table for Hosmer and Lemeshow Test

		Current use of modern contraceptive = No		Current use of modern contraceptive = Yes		Total
		Observed	Expected	Observed	Expected	
Step 1	1	924	927.832	20	16.168	944
	2	910	896.161	35	48.839	945
	3	857	862.832	87	81.168	944
	4	834	828.344	109	114.656	943
	5	787	793.314	157	150.686	944
	6	740	749.667	204	194.333	944
	7	711	695.616	233	248.384	944
	8	628	623.783	316	320.217	944
	9	499	519.625	445	424.375	944
	10	357	349.826	585	592.174	942

Table B2: Summary of Influential Variables Statistics

Influential Variables	Cases	Minimum	Maximum
Analog of Cook's influence statistics	9438	.00000	.10752

Standard residual	9438	-1.89088	2.11736
Normalized residual	9438	-2.89749	2.22427
Leverage value	9438	.00009	.02475
DFBETA			
Constant	9438	-.01464	.06492
Age			
15-19	9438	-.01105	.01006
20-24	9438	-.01220	.01151
25-29	9438	-.01270	.01179
30-34	9438	-.01283	.01216
35-39	9438	-.01264	.01282
40-44	9438	-.01257	.02376
Region			
Tigray	9438	-.01165	.01560
Afar	9438	-.00876	.00510
Amhara	9438	-.00957	.00672
Oromiya	9438	-.01687	.05598
Somali	9438	-.01001	.00866
Benshangul-Gumuz	9438	-.00918	.01001
SNNP	9438	-.01019	.01250
Gambela	9438	-.01224	.01125
Harari	9438	-.01168	.00964
Dire Dawa	9438	-.01274	.01348
Place of residence			
Rural	9438	-.00645	.00532
Religion			
Orthodox	9438	-.00561	.00643
Protestant	9438	-.00500	.00567

Muslim	9438	-.02273	.04263
Wealth status			
Poor	9438	-.00309	.00588
Middle	9438	-.00404	.00428
Knowledge about modern contraception			
No	9438	-.05482	.01623
Number of living Children			
No child	9438	-.01012	.00546
1 child	9438	-.01230	.00646
Desire for more children			
Wants no more	9438	-.00341	.00383
Work status			
Not working	9438	-.00212	.00274
Education level of women			
No education	9438	-.00226	.00313
Primary	9438	-.00697	.00878
Decision maker for use			
Wife	9438	-.03839	.06650
Husband	9438	-.00493	.00603
Education level of husband			
No education	9438	-.00194	.00275
Primary	9438	-.00403	.00597
Exposure to any media			
No	9438	-.00291	.00353

DECLARATIONS

I declare that, this thesis is my original work and that all sources of materials used for this thesis have been duly acknowledged. This work has not been submitted to any other University for achieving any academic degree or diploma awards.

Name: Kebede Abu

Signature: _____

Place: AAU

Date of submission: June, 17, 2013